

## CALIBRATION OF AIR SAMPLING STATIONS

**Purpose** This Meteorology and Air Quality Group (MAQ) procedure describes the process for replacement of AIRNET sampling pumps and the calibration of airflow through the pumps after installation.

**Scope** This procedure applies to the individual assigned to maintain the air pumps used as part of the Meteorology and Air Quality Group ambient air sampling network (AIRNET) system.

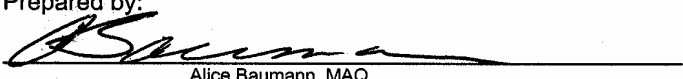
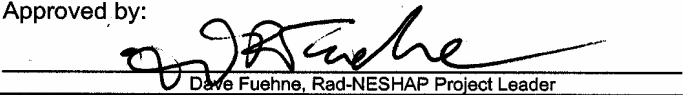
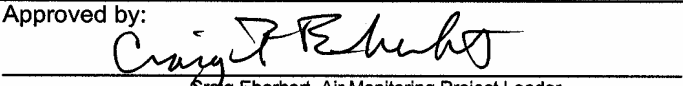
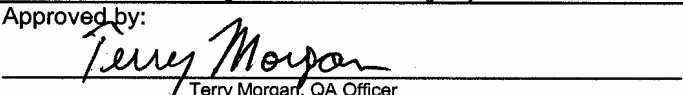

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**Hazard Control Plan**

The hazard evaluation associated with this work is documented in Attachment 1: Initial risk = **medium**. Residual risk = **low**. Work permits required: none. First authorization review date is one year from group leader signature below; subsequent authorizations are on file in group office.

**Signatures**

Prepared by:  Alice Baumann, MAQ	Date: 11/21/02
Approved by:  Dave Fuehne, Rad-NESHAP Project Leader	Date: 11-22-02
Approved by:  Craig Eberhart, Air Monitoring Project Leader	Date: 11/22/2002
Approved by:  Terry Morgan, QA Officer	Date: 11/25/02
Work authorized by:  Jean Deward, MAQ Group Leader	Date: 11/25/02

11/21/02  
05/20/03

### CONTROLLED DOCUMENT

This copy is uncontrolled if no signatures are present or if the copy number stamp is black. Users are responsible for ensuring they work to the latest approved revision.

## General information about this procedure

**Attachments** This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Hazard Control Plan	2

### History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description of Changes
0	4/4/95	New document.
1	10/9/96	Safety considerations added, documentation requirements added and clarified, calibration tolerance corrected to $\pm 0.4$ from $\pm 0.2$ CFM, removed steps for tygon exhaust tubing.
2	7/16/97	Added references to new model of Buck calibrator.
3	8/26/98	Changed criteria and steps for adjusting flow, added Mid-Sampling Period Change of Flow Form.
4	2/2/99	Added requirements for wearing safety shoes when moving pumps; separated steps for calibrating filter and gel flows.
5	2/22/00	Made minor changes to HCP, added HCP as attachment 1, removed attachment "Mid-Sampling Period Change of Flow Form," and added reminders to use lifting equipment and gloves.
6	11/1/00	Changed weight of pumps, changed steps to measure flow after pump replacement.
7	12/10/02	Quick-change revision to change "breaker" to "GFCI" and instructions when calibrator does not agree with silica gel flow meter.

### Who requires training to this procedure?

The following personnel require training before implementing this procedure:

- employees assigned to calibrate air sampling equipment

Employees previously trained to revision 6 of this procedure do not require retraining to this revision.

## General information about this procedure, continued

<b>Training method</b>	The training method for this procedure is <b>on-the-job training</b> by a previously trained individual and is documented in accordance with the procedure for training (MAQ-024).
<b>Prerequisites</b>	<p>In addition to training to this procedure, the following training is also required prior to performing this procedure:</p> <ul style="list-style-type: none"><li>• MAQ-011, “Logbook Use and Control”</li><li>• MAQ-202, “Environmental Sampling of Airborne Particulate Radionuclides”</li><li>• MAQ-204, “Sampling of Airborne Tritium”</li><li>• Rad Worker I training</li><li>• CPR and First Aid</li><li>• TA-54 site-specific training</li><li>• TA-15 site-specific training</li><li>• ESH-13 training “Electrical Safe Work Practices for Nonelectrical Crafts Workers” (course #12175)</li></ul> <p>Periodically review the field safety information in the Employee Notebook (see MAQ-032).</p>
<b>Definitions specific to this procedure</b>	None.
<b>References</b>	<p>The following documents are referenced in this procedure:</p> <ul style="list-style-type: none"><li>• MAQ-024, “Personnel Training”</li><li>• MAQ-032, “Orienting New Employees”</li><li>• MAQ-011, “Logbook Use and Control”</li><li>• MAQ-202, “Environmental Sampling of Airborne Particulate Radionuclides”</li><li>• MAQ-204, “Sampling of Airborne Tritium”</li></ul>
<b>Note</b>	Actions specified within this procedure, unless preceded with “should” or “may”, are to be considered mandatory guidance (i.e., “shall”).

## Replacement of pumps

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### Caution at damaged stations

When approaching a station, if the AIRNET station housing appears damaged in such a way that electrical wires are exposed or could be shorted to the housing or conduit, **do not touch the station!** Immediately report the damage and request that JCNNM repair the electrical damage.

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### Required safety equipment

Wear steel-toed shoes anytime you are carrying or lifting pumps. Use the lift table and tailgate of the truck to assist with lifting pumps. Avoid “dead lifts” from ground level; get help to lift pumps on the ground or floor.

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### Safety in the field

Review the field safety concerns in the block about Worker Safety in procedure MAQ-202. This reminds you about hazards of thunderstorms, working alone, falling, and electricity.

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### Regular replacement of pumps

Replace vacuum pumps in the AIRNET sampling stations every six months according to the rotation schedule in the AIRNET Field Log (kept inside the front cover of the field logbook).

Replacement pumps are kept at the Cave at TA-54-1001.

**CAUTION:** The pumps will be hot after running continuously – use gloves to handle hot pumps.

**CAUTION:** Pumps weigh 40 to 60 pounds -- use proper lifting techniques or get assistance when moving them.

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### Checking tubing

Whenever a pump is replaced, reattach exhaust and intake hoses, and check all fittings and airflow passages for leaks or obstructions. Pay particular attention to the joints between airflow tubing and brass fittings, located on the rear of the sampling head. Replace any tubing that appears brittle or torn.

After a new pump has been installed in the station, calibrate the sampling heads according to the instructions in the following chapter.

## Replacement of pumps, continued

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**Recording  
pump  
replacement**

Enter the following information in the field log book (make all logbook entries according to MAQ-011):

- station number and location
- date and time
- name or initials of installer
- end filter flow (as-found flow)
- end silica gel flow (as-found flow)
- replaced pump number
- installed pump number

## Calibration of pump flow

**Calibration** Recalibrate vacuum pumps in the AIRNET sampling stations every six months according to the rotation schedule in the AIRNET Field Log (kept in the Cave TA-54-1001).

Replace a pump after six months of service. When a pump is replaced, perform the following steps to calibrate the airflow through the filter assembly. Collect the equipment listed below before leaving for the sampling sites.

**Equipment needed** The following equipment and tools are needed to perform pump calibrations at the sampler sites:

- Model C-828 Air Flow Calibrator (kept in TA-54-1001)
- Mini-Buck Model M-30 or M-5 Calibrator (kept in TA-54-1001)
- pocket allen wrench set
- soap solution (kept in Calibrator carrying case)
- 3/8 inch box wrench
- new filter and filter holder (for checking calibrated air flow)

**Steps to calibrate the filter air flow**

To calibrate the air flow through the filter, perform the following steps:

Step	Action
1	Record the date, station number, filter flow rate, silica gel flow rate, and timer reading.
2	Disconnect the air filter cartridge from the sampling head, and set aside temporarily. Replace with a cartridge containing a clean filter.
3	Slip the Model C-828 Air Flow Calibrator over the clean cartridge.
4	Using the large black knob on the front of the sampling head, adjust air flow to $4.0 \pm 0.4$ CFM, indicated on the calibrator.
5	Remove the Air Flow Calibrator from the sampling head, remove the clean cartridge, and reconnect the air filter cartridge.
6	Slip the calibrator over the cartridge with the current filter and record the indicated flow in the field logbook.

## Calibration of pump flow, continued

### Steps to calibrate the silica gel air flow

To calibrate the air flow through the silica gel, perform the following steps:

Step	Action
1	Place the Mini-Buck Model M-30 or M-5 Calibrator in the air station enclosure, in the shade if possible. Turn on the Calibrator.
2	If additional soap solution is needed, add approximately 1 teaspoon of soap solution to the inlet tube at the bottom of the Calibrator.
3	Pull the tritium cartridge out of its holder on the bottom of the air sampling enclosure. Connect the quick-disconnect fitting to the bottom of the cartridge. Connect the outlet fitting of the calibrator to the cartridge. (The outlet fitting is at the end of a piece of flexible tubing connected to the Model M-30 or M-5.)
4	Depress the calibrate button on the M-30 or M-5, and hold until a bubble forms in the base of the unit (normally about 1 second). Release button.
5	Within 1 minute the flow, in cc/min or L/min, should be displayed on the calibrator. Note in the logbook the flow indicated by <b>both</b> the calibrator and the flow meter.
6	Turn off and disconnect the calibrator. Remove the quick-disconnect fitting from the cartridge and return the cartridge to its holder.

### Test breaker

Press the “TEST” button on the GFCI. Verify that the breaker stops the pump and that it resumes when power is restored. Record the test actions in field logbook.

### Record calibration data

Once calibration has been completed, enter the following information into the AIRNET Field Log:

- date and time
- name or initials of calibrator
- pump number
- identifier (e.g., serial number) of the calibrators used
- calibrated flow of silica gel (as indicated by calibrator)
- silica gel flow meter reading
- calibrated flow of filter (as indicated by calibrator)
- filter flow meter reading
- test of GFCI breaker

## Calibration of air flow calibrators

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### **Annual calibration of calibrators**

Return the calibrators to the factory for calibration every year, or more frequently if the calibration is suspected for any reason.

Send the Model C-828 calibrators to:

SAIC Radeco  
4161 Campus Point Rd.  
San Diego, CA 92121  
Phone 619-458-3831

Send the Model C-30 and M-5 calibrators to:

A. P. Buck Inc.  
3139 S. Orange Ave.  
Orlando, FL 32806  
Phone 407-851-8602

Maintain all records of the calibration and maintenance performed on the calibrators, including the certificates of calibration.



## Records resulting from this procedure

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### Records

The following records generated as a result of this procedure are to be submitted as records to the Records Coordinator:

- entries in the AIRNET field log (made according to MAQ-011)
  - date and time
  - name of installer
  - numbers of pumps removed and installed
  - flow rates before and after pump replacement
  - identifier of calibrators used
- certificates from the manufacturers of annual calibration of the calibrators



## HAZARD CONTROL PLAN

1. The work to be performed is described in this procedure:

### “Calibration of Air Sampling Stations”

2. Describe potential hazards associated with the work (use continuation page if needed).

Lifting Injuries--lifting pumps in/out of air sampling station  
Thermal burns--skin burns from removing pumps from sampling housing  
Abrasions from moving pumps  
Falls  
Tripping  
Animal Encounters (snakes, mountain lions, etc.)  
Weather (lightning, heat stress, cold stress)  
High Explosives testing (TA-15, TA-16, TA-49)  
Radiation Areas (TA-54- Area-G, TA-16)  
Electrical shock in wet conditions  
Electrical shock from damaged electrical conduit via vehicle or large animal  
Dropping pumps

3. For each hazard, list the likelihood and severity, and the resulting initial risk level (before any work controls are applied, as determined according to LIR300-00-01.0, section 7.2)

Abrasions from moving pumps—Occasional/Negligible = Minimal  
Lifting Injuries--lifting pumps in/out of air sampling station--Occasional/Moderate = Low  
Thermal burns--skin burns from removing hot pumps –Occasional/Negligible = Minimal  
Falls - Improbable / Critical = Low  
Tripping – Occasional / Moderate = Low  
Animal Injuries - Remote / Critical = Minimal  
Lightning – Remote / Catastrophic = Low  
Entry into High Explosives testing areas – Remote / catastrophic = Low  
Entry into posted Radiation/Controlled areas – Remote / Negligible = Minimal  
Electrical shock in wet conditions – Remote / improbable / Catastrophic = medium  
Electrical shock from damaged electrical conduit via vehicle or animal – Improbable / Catastrophic = low  
Dropping pumps onto feet -- Improbable / Critical = Low

Overall *initial* risk: ☐ Minimal ☐ Low ☒ Medium ☐ High

4. Applicable Laboratory, facility, or activity operational requirements directly related to the work:

☐ None ☒ List: Work Permits required? ☒ No ☐ List:

LIR-402-706-01 “Personnel Dosimetry”  
LIR-402-718-01 “Radiological Training”  
Access Control Requirements for TA-15, TA-16, TA-49, TA-54  
29CFR1926.500, Subpart M, Section 502, “Fall protection”  
National Fire Protection Code --for use of electrical GCFIs  
LIR 402-600-01.0 "Electrical Safety" for all electrical hazards

### HAZARD CONTROL PLAN, continued

5. Describe how the hazards listed above will be mitigated (e.g., safety equipment, administrative controls, etc.):

Lifting Injuries -- lifting pumps in/out of air sampling station -- training in proper lifting techniques.

A previous ergonomic review identified stations where improvements were made.

Thermal burns from removing hot pumps -- Wear gloves and long sleeves or gauntlets.

Abrasions from moving pumps -- Use common sense to avoid these injuries; also covered under MAQ Employee Orientation training.

Falls -- MAQ Employee Orientation includes training and awareness of tripping and falls.

Tripping -- same as above. Animal Injuries -- same as above. Weather -- same as above.

Entry into High Explosives testing Areas -- existing facility access controls include site specific training, sign-in/sign-out, and scheduling procedures.

Entry into posted Radiation/Controlled areas -- Area-G and TA-15 require entry through manned access control gates; self monitoring required before leaving areas.

Electrical shock in wet conditions -- all stations were retrofitted with GFCI (ground fault interrupts)

Electrical shock from damaged electrical conduit -- the administrative control requires that JCNNM be contacted to shut off power prior to any further work

Dropping pumps onto feet -- Steel-toed shoes/boots must be worn whenever carrying pumps.

6. Knowledge, skills, abilities, and training necessary to safely perform this work (check one or both):



Group-level orientation (per MAQ-032) and training to this procedure.



Other → See training prerequisites on procedure page 3. Any additional describe here:

7. Any wastes and/or residual materials? (check one) ☒ None ☐ List:

8. Considering the administrative and engineering controls to be used, the *residual* risk level (as determined according to LIR300-00-01.0, section 7.3.3) is (check one):



Minimal



Low



Medium (requires approval by Division Director)

9. Emergency actions to take in event of control failures or abnormal operation (check one):



None



List:

For all injuries, provide first aid and ensure injured person is taken to ESH-2 or the hospital. For any exposed, energized electrical wires, contact JCNNM, facility manager, or other appropriate authority to turn off the power. Follow all site-specific emergency plans for radiation or explosives emergencies.

Signature of preparer of this HCP: This HCP was prepared by a knowledgeable individual and reviewed in accordance with requirements in LIR 300-00-01 and LIR 300-00-02.

Preparer(s) signature(s)

Name(s) (print)

/Position

Date

Signature by group leader on procedure title page signifies authorization to perform work for personnel properly trained to this procedure. This authorization will be renewed annually and documented in MAQ records.

Controlled copies are considered authorized. Work will be performed to controlled copies only. This plan and procedure will be revised according to MAQ-022 and distributed according to MAQ-030.